

important broadband projects. As noted above, by February 2011, the Recovery Act also directed NTIA to create a “comprehensive nationwide inventory map of existing broadband service capability and availability” that shows the geographic extent to which that capability is deployed and available for each state.¹¹² NTIA must make this inventory map accessible by the public on an NTIA website in a form that is interactive and searchable. These programs are discussed in detail below.¹¹³

IV. COORDINATION OF RURAL BROADBAND EFFORTS

48. As part of its mandate to develop a rural broadband strategy, Congress tasked us with developing recommendations to promote interagency coordination and to streamline and improve federal agencies’ policies, programs, and services.¹¹⁴ Congress also tasked the Commission with developing recommendations for coordinating existing federal rural broadband initiatives.¹¹⁵ These legislative requirements were established before the 2008 election and before the enactment of the Recovery Act. As there has been considerable interagency coordination in the weeks following the passage of the Recovery Act, the recommendations here are to support and promote the continued interagency coordination that now exists with the expectation that this will result in improvements to existing and new federal programs.

49. Much like extending the reach of railroads across the country or bringing electricity and telephones to rural areas, ensuring that broadband service is available to all Americans is a massive undertaking in which there is a significant role for government. In fact, a number of federal agencies have already developed and implemented programs related to the buildout of broadband in rural areas.

50. *The Role of the USDA’s RUS.* The USDA’s RUS plays a particularly important role in administering programs that aim to expand utilities and new technologies to rural communities. In particular, RUS administers three programs aimed specifically at improving broadband access: the Rural Broadband Access Loan and Loan Guarantee Program;¹¹⁶ the Community Connect Grant Program;¹¹⁷ and

¹¹² *Id.* § 6001(1).

¹¹³ See *infra* Parts IV, V.C (discussing the Recovery Act).

¹¹⁴ 2008 Farm Bill § 6112(a)(1)(A).

¹¹⁵ *Id.* § 6112(a)(1)(B).

¹¹⁶ The Rural Broadband Access Loan and Loan Guarantee Program provides loans and loan guarantees to fund the “cost of construction, improvement, or acquisition of facilities and equipment for broadband service,” with priority given to areas where broadband service is not available or is inadequate. RUS is in the process of promulgating regulations to implement program requirements mandated by the 2008 Farm Bill. See 7 C.F.R. § 1738.10–11; USDA Telecommunications Program: Rural Development Broadband Loan and Loan Guarantee Program, <http://www.usda.gov/rus/telecom/broadband.htm> (last visited May 19, 2009). We note that on April 13, 2009, USDA’s Inspector General released an audit report regarding RUS’s broadband loan program, finding that the agency had not implemented eight of fourteen recommendations from a 2005 audit report and expressing concerns about the future of the program. See OFFICE OF INSPECTOR GENERAL, USDA, REPORT NO. 09601-8-Te, AUDIT REPORT: RURAL UTILITIES SERVICE BROADBAND LOAN AND LOAN GUARANTEE PROGRAM 4, 10 (2009), available at <http://www.usda.gov/oig/webdocs/09601-8-TE.pdf>. We understand that the 2008 Farm Bill addressed six of these recommendations, and RUS is taking responsive action to the extent it can, regarding the remaining two recommendations. See *id.* at 4.

¹¹⁷ The Community Connect Grant Program provides financial assistance to unserved areas to connect critical community facilities, such as schools, libraries, hospitals, law enforcement, emergency services, and public safety organizations. Funds may be used to finance the construction and acquisition of facilities to deploy broadband and to purchase end-user equipment. At a minimum, a project must deploy basic broadband to critical community facilities free of charge for two years; offer basic broadband to all residential and business customers within the service area; and provide free access at a community center for at least two years. See Broadband Grant Program, 69 Fed. Reg. 44,896, 44,897 (Jul. 28, 2004); 7 C.F.R. § 1739.11–12.

the Distance Learning and Telemedicine Loan and Grant Program.¹¹⁸ The funding available under these programs to expand broadband coverage helps offset prohibitively high deployment costs that plague many rural areas. As part of the Recovery Act, Congress authorized an additional \$2.5 billion in funding for these programs.¹¹⁹

51. Numerous RUS programs have already started to increase rural broadband deployment. For example, as early as 2004, RUS began to work with International Broadband Electric Communications, Inc. (IBEC) in Huntsville, Alabama, to fund deployment of broadband solutions in a number of rural locations.¹²⁰ As a result, residents in the targeted communities will be able, many for the first time, to access the Internet at speeds of up to 5 Mbps. Another company that has successfully worked with the RUS is Rural Telephone Service Co. (Rural Telephone), a Lenora, Kansas-based incumbent local exchange carrier (LEC) that began working with the RUS shortly after its incorporation in 1951. Rural Telephone has used RUS funding to become an operator of 29 exchanges in a rural area that averages two households per square mile.¹²¹ Through its competitive LEC affiliate, Nex-Tech, Rural Telephone also has used RUS funding to deploy fiber to the home infrastructure in neighboring towns. In many cases, Nex-Tech is bringing broadband to customers for the very first time.¹²²

52. RUS also has worked with Air Advantage LLC (Air Advantage), a wireless ISP headquartered in Frankenmuth, Michigan. Air Advantage uses a broad portfolio of wireless solutions to deliver reliable and secure broadband connectivity to thousands of rural businesses and residents in rural Eastern Michigan.¹²³ Over the past six years, the company has secured three RUS Community Connect Broadband Grants and used the Broadband Loan Program to expand the footprint of its wireless network and increase broadband connectivity to local businesses and residents.¹²⁴ Related developments include the creation of computer labs in two local community centers that provide the residents with free broadband Internet access¹²⁵ and the deployment of distance learning technologies throughout seven

¹¹⁸ The Distance Learning and Telemedicine programs provide a combination of loans and grants to improve educational and health care opportunities. The grant program focuses primarily on connecting students and teachers or medical providers and patients at separate locations, while the loan and combination loan/grant program seeks to fund additional resources to improve medical care and education. Funds generally are used to finance broadband infrastructure, purchase land and buildings, acquire end-user and other equipment, and provide technical assistance and instruction. See 7 C.F.R. §§ 1703.121, 1703.130, 1703.140; USDA Telecommunications Program: Loans and Grants, <http://www.usda.gov/rus/telecom/RDtelecom-loansandgrants.htm> (last visited May 19, 2009).

¹¹⁹ Recovery Act, Division A, Title I, Rural Utilities Service (RUS Appropriations).

¹²⁰ See, e.g., Press Release, IBEC (Feb. 2, 2004), <http://www.ibec.net/pdf/IBEC%20Achieves%20Conditional%20RUS%20approval%20for%20its%20BPL%20Solution.pdf>.

¹²¹ See Joan Engebretson, *Funding Fiber to the Farm*, TELEPHONY ONLINE, Feb. 5, 2007, http://telephonyonline.com/mag/telecom_funding_fiber_farm/ (quoting Larry Sevier, Rural Telephone CEO and General Manager, "'As we grew from one rural exchange to 29, we put in the latest technology,' he said. 'All through the process, we used the RUS program. This area is extremely sparsely populated, with an average of two households per square mile.'").

¹²² *Id.*

¹²³ See generally Presentation of Scott Zimmer, President of Air Advantage, Using Broadband To Make Rural Michigan A Better Place to Live and Work, <http://wireless.fcc.gov/outreach/presentations/saginaw2008/SuccessStories/SAGINAW%20-%20Air%20Advantage%20Success%20Story.pdf> (last visited May 8, 2009).

¹²⁴ See Press Release, Motorola Corporation (May 7, 2009), <http://news.prnewswire.com/DisplayReleaseContent.aspx?ACCT=104&STORY=/www/story/05-07-2009/0005021331&EDATE>.

¹²⁵ *Id.*

partner rural school systems using funding from an RUS Distance Learning/Telemedicine Grant.¹²⁶ In addition, the Air Advantage network has linked several rural hospitals to enable data and record sharing, as well as enabling the Saginaw Valley State University to establish distance learning professional development courses at these healthcare facilities.¹²⁷ Air Advantage is using its most recent Community Connect Broadband Grant, approved in 2008, to provide wireless broadband access to the small community of Applegate, Michigan, where it is working with local officials to expand the village hall to include a new community center that will host a computer lab with free Internet access.

53. The RUS broadband programs face several challenges. Unlike some of RUS's other infrastructure programs, the RUS broadband programs only have a limited ability to offer projects combining loan and grant funds. The primary RUS broadband program is the Broadband Loan Program. Under the Broadband Loan Program, it is difficult for RUS to reach small remote places, like Weirwood, Virginia, because the community lacks the needed resources to make a broadband loan work. Places like Weirwood are better candidates for the Community Connect Broadband Grant program, but the funding for that program is severely limited (\$13.4 million for the 2009 fiscal year). However, the Recovery Act provides RUS the resources to administer a broadband program that offers assistance in the form of grants and loan/grant combinations designed to assist communities like Weirwood.

54. *NTIA*. The NTIA also has an important role to play in broadband development. The Recovery Act appropriates \$4.7 billion to the NTIA to "establish a national broadband service development and expansion program" called the "Broadband Technology Opportunities Program" (BTOP).¹²⁸ This program will award grants¹²⁹ to states, non-profit organizations, and broadband providers to fulfill the broadband deployment goals of the Recovery Act.¹³⁰ The NTIA must award, "to the extent practical," at least one grant in each state,¹³¹ and in doing so must consider a variety of factors,

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ Recovery Act, Division A, Title II, National Telecommunications and Information Administration (NTIA Appropriations); Recovery Act § 6001. The BTOP has five enumerated purposes in the Recovery Act: "(1) provide access to broadband service to consumers residing in unserved areas of the United States; (2) provide improved access to broadband service to consumers residing in underserved areas of the United States; (3) provide broadband education, awareness, training, access, equipment, and support to [organizations including schools, libraries, health care providers, and outreach organizations]; (4) improve access to, and use of, broadband service by public safety agencies; and (5) stimulate the demand for broadband, economic growth, and job creation." Recovery Act § 6001(b); *see also* United States Department of Commerce, Information Related to the American Recovery and Reinvestment Act of 2009, <http://www.commerce.gov/Recovery/> (last visited May 19, 2009).

¹²⁹ NTIA may award competitive grants to: "(1) acquire equipment, instrumentation, networking capability, hardware and software, digital network technology, and infrastructure for broadband services; (2) construct and deploy broadband service related infrastructure; (3) ensure access to broadband service by community anchor institutions; (4) facilitate access to broadband service by low-income, unemployed, aged, and otherwise vulnerable populations in order to provide educational and employment opportunities to members of such populations; (5) construct and deploy broadband facilities that improve public safety broadband communications services; and (6) undertake such other projects and activities as the Assistant Secretary finds to be consistent with the purposes for which the program is established." Recovery Act § 6001(g).

¹³⁰ Specifically, the Recovery Act states, "To be eligible for a grant under the program, an applicant shall—(1)(A) be a State or political subdivision thereof, the District of Columbia, a territory or possession of the United States, an Indian tribe (as defined in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450(b)) or native Hawaiian organization; (B) a nonprofit—(i) foundation, (ii) corporation, (iii) institution, or (iv) association; or (C) any other entity, including a broadband service or infrastructure provider, that the Assistant Secretary finds by rule to be in the public interest. In establishing such rule, the Assistant Secretary shall to the extent practicable promote the purposes of this section in a technologically neutral manner." *Id.* § 6001(e).

¹³¹ *Id.* § 6001(h)(1).

including affordability and speed, as well as improved access for healthcare, education, and children,¹³² and “whether the applicant is a socially and economically disadvantaged small business concern.”¹³³ Grantees under this program will also be subject to “non-discrimination and network interconnection” obligations.¹³⁴

55. In addition, the Recovery Act requires NTIA to “develop and maintain a comprehensive nationwide inventory map of existing broadband service capability and availability in the United States that depicts the geographic extent to which broadband service capability is deployed and available from a commercial provider or public provider throughout each State.”¹³⁵ Such a map is required to be made accessible in an interactive and searchable format on the web by February 17, 2011.¹³⁶

56. *Other Agencies.* There are several other programs run by various federal agencies, including the Commission, that provide or have provided broadband-related funding.¹³⁷ Developed essentially in administrative silos and existing in parallel within their respective administrative agencies, these programs are responsible for significant annual spending. We believe that in enacting the 2008 Farm Bill, Congress implicitly recognized that many of these programs do share common broadband purposes and goals; however, coordination between federal agencies has been lacking. As Congress recognized, greater coordination among agencies, policies, programs, and staff is needed to realize the full benefit of federal resources that have already been dedicated to bringing broadband to rural America and to best leverage further investments of both taxpayer monies and private capital. We recognize positive changes that have occurred in recent months with regard to broadband coordination to address these prior shortcomings.

A. Promoting Interagency Coordination

57. Lack of interagency coordination is a significant challenge to the deployment of broadband in rural areas. Consequently, we believe that increasing coordination—among federal departments and agencies; Tribal, state, and local governments; community groups; and individuals—is a critical preliminary step toward ensuring that the various government programs accomplish their broadband goals and objectives in an efficient and effective way. Promoting and fostering a culture that encourages the exchange of information within and between federal agencies and, where appropriate, with non-federal government organizations, Tribal governments, and the public lie at the core of effective coordination. Successfully implemented, the coordination strategy we outline below should enable the federal government and other stakeholders to work together to maximize resources, harness expertise, and avoid duplication of effort in facilitating the deployment of broadband in rural areas.

58. In highlighting areas where better coordination may be needed, we hope to underscore the particular challenges faced by rural America in the deployment and adoption of broadband services that should be considered in conjunction with every agency’s broadband policy. To this end, the

¹³² *Id.* § 6001(h)(2).

¹³³ *Id.* § 6001(h)(3).

¹³⁴ *Id.* § 6001(j). Section 6001(j) of the Recovery Act states, “Concurrent with the issuance of the Request for Proposal for grant applications pursuant to this section, the Assistant Secretary shall, in coordination with the Commission, publish the non-discrimination and network interconnection obligations that shall be contractual conditions of grants awarded under this section, including, at a minimum, adherence to the principles contained in the Commission’s broadband policy statement (FCC 05-15, [1] adopted August 5, 2005).” *Id.*

¹³⁵ Recovery Act § 6001(l).

¹³⁶ *Id.*

¹³⁷ Appendix B provides a non-exhaustive list of these programs.

Commission has invited suggestions from the public on both formal and informal means of coordination among federal departments and agencies; Tribal, state, and local governments; and community groups and individuals to achieve Congress's goal that *all* Americans have access to broadband.¹³⁸

1. Federal Interagency Coordination

59. Shortly after President Obama took office, his administration undertook an important leadership role in the effort to expand broadband penetration throughout the nation. In early 2009, the Obama administration formed an interagency working group under the auspices of the National Economic Council to bring agencies together to discuss broadband issues of common interest.

60. This interagency working group is focused on coordinating the country's broadband agenda and has sought input from agencies regarding their broadband programs to this end. The formation of this group gives expert staff in different federal agencies an unprecedented opportunity to meet, discuss, and coordinate complementary federal broadband programs and policies, and prioritize agency actions to avoid wasted resources. Thus far, a significant focus of the group has been on ensuring that the Recovery Act stimulus programs related to broadband are implemented in a coordinated manner. It also facilitated discussions among federal agencies and the submission of information in connection with the development of this Report. The administration should be commended for these efforts. We recommend that the interagency working group continue, devoting special attention as appropriate to enhancing interagency coordination on rural broadband initiatives.¹³⁹ We believe, at a minimum, that such a focus could serve as a vital step in ensuring that federal agencies do not work at cross purposes and form an important component of a national broadband plan.

61. In addition to the interagency working group, we believe that there are additional steps that can be taken to promote interagency coordination. For example, joint hearings, such as those held recently by the NTIA and USDA regarding the Recovery Act's broadband provisions, can help to promote interagency coordination and provide a forum for the public to provide input toward the shaping and implementation of complementary federal programs. Joint hearings may also facilitate federal, Tribal, state, and local cooperation. To that end, we suggest, for example, that the Commission may want to hold joint public meetings or hearings with USDA and NTIA to gain valuable public input regarding their complementary broadband agendas. We further recommend that the Commission and other federal agencies consider developing their own "rural broadband agendas," consistent with the national broadband plan. This agenda could include the agency's pending (and perhaps planned) proceedings affecting rural broadband. The agencies could share these agendas with each other and, to the extent they do not include confidential information, with the public.

2. Additional Coordination

a. Coordination with Tribal Governments

62. It is critical that federal agencies devote increased attention to improving coordination and collaboration with Tribal governments,¹⁴⁰ consortia, and organizations regarding broadband

¹³⁸ See *National Broadband Plan NOI* at paras. 113–22.

¹³⁹ See, e.g., AFBF Comments at 2; NASUCA Comments at 6; NATOA Comments at 5; Nebraska Commission Comments at 5–6; Pennsylvania Comments at 2; USTA Comments at 2; WISPA Comments at 4.

¹⁴⁰ The terms "Tribal Nation," "Indian Tribe[s]," or "Tribes" refer to any Indian or Alaska Native tribe, band, nation, pueblo, village, or community that is acknowledged by the federal government to constitute a governmental entity necessary to enter into a government-to-government relationship with the United States and thereby be eligible for the programs and services established by the United States for Indians. See The Federally Recognized Indian Tribe List Act of 1994, Pub. L. 103-454, 108 Stat. 4791 (1994) (Indian Tribe Act) (requiring the Secretary of the Interior

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deployment in rural Tribal areas.¹⁴¹ Encouraging broadband deployment in these areas presents unique issues.¹⁴² To ensure a truly comprehensive strategy for addressing rural broadband, it is important that the federal government maintain a continuing dialogue with Tribal governments to address these issues. The Commission has taken a series of steps, through regulatory action, the publication of consumer information, and Tribal outreach, to address the lack of communications deployment and subscribership throughout Indian Country. For example, in the *Tribal Policy Statement*, the Commission reaffirmed its recognition of Tribal sovereignty and the trust relationship between the Commission as part of the federal government and Tribal Nations.¹⁴³ This policy statement indicates the Commission values a government-to-government relationship with federally recognized Indian Tribes and Alaska Native communities. Close consultation between the Commission and the Tribes is the Commission's principal means of identifying and working to resolve communication policy issues relevant to Indian Country. The *Tribal Policy Statement* describes the Commission's consultative and trust responsibilities toward the Tribes. It also expresses the Commission's commitment to work cooperatively with Tribal, state, and local governments as well as other federal departments and agencies to address and remedy communication problems in Indian Country, such as low telephone and broadband penetration rates and poor service quality.

63. In addition to the *Tribal Policy Statement*, the Commission created Tribal Land bidding credits to assist those Tribal communities with the greatest need for telecommunications services. The Tribal Land bidding credits provide winning bidders in spectrum auctions that agree to deploy facilities and provide service in certain Tribal areas with a discount on their spectrum.¹⁴⁴ The Commission also established the Indian Telecommunications Initiative (ITI) to help improve telecommunications services on Tribal lands. The ITI seeks to increase telephone subscribership rates on Tribal lands, upgrade the telecommunications infrastructure on those lands, and inform Tribal consumers about the financial support available through federal programs, such as the Universal Service programs.¹⁴⁵ The ITI also

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to publish in the Federal Register an annual list of all Indian Tribes which the Secretary recognizes to be eligible for the special programs and services provided by the United States to Indians because of their status as Indians).

¹⁴¹ See *supra* note 54 (concerning the definition of Indian Country).

¹⁴² For example, Sacred Wind explains that some federal rules and practices fail to recognize the "special characteristics" of Tribal lands. See Sacred Wind Comments at 1–2. Sacred Wind states, for example, that the definition of a rural community for the USDA's RUS Community Connect Grant Program "excludes communities that are not registered as Census Designated Places" and only a handful of the 111 chapters of the Navajo Nation are registered. Sacred Wind further explains that federal law requires environmental and archeological surveys before any federally-financed construction on Tribal lands, even if the lands already have been surveyed or are within utility easements. See Sacred Wind Comments at 2.

¹⁴³ See *Statement of Policy on Establishing a Government-to-Government Relationship with Indian Tribes*, Policy Statement, 16 FCC Rcd 4078 (2000) (*Tribal Policy Statement*).

¹⁴⁴ See *infra* Part VI.C (providing a detailed discussion of Tribal Land bidding credits).

¹⁴⁵ See FCC, ITI, <http://www.fcc.gov/indians/iti.html> (last visited May 19, 2009). Since its inception, ITI has organized informational workshops to provide Tribes and Tribal organizations with information about Commission rules and policies, such as cellular tower siting procedures and broadband deployment that affect the deployment of telecommunications infrastructure and services on Tribal lands. The ITI seeks to offer clear, practical, solution-oriented information the Tribes can use to benefit their communities and enhance their economic and social development regarding deployment and subscribership challenges. In addition, the Commission's Consumer and Governmental Affairs Bureau, through its Liaison to Tribal Governments and the ITI, seeks to: (1) educate and inform Tribes about telecommunications; (2) confer with Tribal representatives about the Commission's rules, regulations, and policies; (3) assist Tribes in networking with each other to develop viable telecommunications systems; and (4) engage in dialogue with Tribes how to overcome about barriers to obtaining telecommunications technologies. The Commission also conducts outreach through various other mechanisms, including publications or advisories tailored specifically to consumers living on Tribal lands, attendance and participation at Tribal

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seeks to promote understanding, cooperation, and trust among Tribal Nations, government agencies, and the communications industry in addressing issues facing Tribal lands. As part of the ITI, Commission staff maintains regular contact with Tribal telecommunications professionals and Tribal representatives. Commission senior officials and other staff also attend and participate in a variety of meetings on telecommunications issues with Tribal officials and representatives.

64. Although much has been done to foster cooperation, collaboration, and communication with Tribal governments, much work remains. Not only are residents of Tribal lands lagging behind the country as a whole in broadband access, but many still do not even have access to voice service;¹⁴⁶ Native American communities have the lowest reported levels of telephone subscribership in the country.¹⁴⁷ Thus, as an initial matter, we suggest that federal agencies consider how to maximize already existing programs to improve coordination with Tribal governments. We also recommend that the Commission consult with Tribal governments pursuant to the *Tribal Policy Statement* in developing its national broadband plan and, in particular, in developing the aspects of that plan that affect broadband deployment and subscribership specifically on Tribal lands. Further, before promulgating any regulation, agencies may want to consider conducting formal consultations with Tribal governments as may be required under Executive Order No. 13175.¹⁴⁸

b. Coordination with State and Local Authorities

65. As part of the nation's rural broadband strategy, we believe that federal agencies should seek to establish an ongoing dialogue with state and local authorities. State and local governments have knowledge unique to their areas. Many states have broadband initiatives, and in some cases, entities are already working to address the broadband needs of unserved and underserved rural areas.¹⁴⁹ A dialogue

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conferences and events, and periodic meetings with Tribal representatives. In response to feedback received directly from the Tribes, the Commission has conducted targeted outreach regarding telecommunications issues of interest to Tribes, such as the Lifeline/Link Up programs and broadband deployment.

¹⁴⁶ See *supra* Part III.B (noting a lack of broadband service on Tribal lands); see also GAO, CHALLENGES TO ASSESSING AND IMPROVING TELECOMMUNICATIONS FOR NATIVE AMERICANS ON TRIBAL LANDS, GAO-06-189, at 10–13 (2006) <http://www.gao.gov/new.items/d06513t.pdf> (2006 GAO TRIBAL LANDS REPORT) (explaining that according to the 2000 census, the telephone subscribership rate for Native American households on Tribal lands in the lower 48 states was 68.6%, while for Alaska Native Villages it was 87.0%—both substantially below the national rate of 97.6%).

¹⁴⁷ See, e.g., *Sacred Wind Communications, Inc. and Qwest Corporation, Joint Petition for Waiver of the Definition of "Study Area" Contained in Part 36, Appendix-Glossary of the Commission's Rules, Sacred Wind Communications, Inc., Related Waivers of Parts 36, 54, and 69 of the Communication's Rules*, CC Docket No. 96-45, Order, 21 FCC Rcd 9227, 9231, para. 9 (2006); see also *Federal-State Joint Board on Universal Service*, CC Docket No. 96-45, Memorandum Opinion and Order, and Further Notice of Proposed Rulemaking, 15 FCC Rcd 12208, 12217–18, para. 16 (2000) (amending Lifeline and Link-Up assistance rules applicable to eligible residents of Tribal lands, consisting of qualifying low-income consumers living on or near reservations, as defined in 25 C.F.R. § 20.1(r), (v)); *Federal-State Joint Board on Universal Service; Promoting Deployment and Subscribership in Unserved and Underserved Areas, Including Tribal and Insular Areas*, CC Docket No. 96-45, Order and Further Notice of Proposed Rulemaking, 15 FCC Rcd 17122 (2000) (seeking additional comment on extending the enhanced Lifeline and Link-Up measures to qualifying low-income consumers living in areas near reservations to target support to underserved, geographically isolated, and impoverished areas that are characterized by low subscribership).

¹⁴⁸ Consultation and Coordination with Indian Tribal Governments, Exec. Order No. 13175, 65 Fed. Reg. 67249 (Nov. 9, 2000).

¹⁴⁹ See *infra* Part V.B (discussing state initiatives regarding mapping and data collection); see also Massachusetts Commission Comments at 4–5; Michigan Commission Comments at 5; NGA CTR. FOR BEST PRACTICES, STATE EFFORTS TO EXPAND BROADBAND ACCESS 4 (2008), <http://www.nga.org/Files/pdf/>

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among state and local entities and federal agencies enables state and local governments to gain valuable information concerning federal resources and initiatives. At the same time, federal-state coordination allows the federal government access to the states' valuable knowledge and experience,¹⁵⁰ helps inform the federal government in establishing rural broadband policies and initiatives, and prevents wasted time and resources from duplicating states' efforts.

66. When the Commission is fully constituted, we recommend that the states take full advantage of existing mechanisms for coordination, such as the Joint Conference on Advanced Services.¹⁵¹ We further recommend that the Joint Conference provide the Commission with its own recommendations for improving federal coordination with states regarding rural broadband deployment.¹⁵² We understand that the state members of the Joint Conference have already begun the process of compiling an inventory of "best practices" and successful state and local projects as an aid to industry, consumers, and fellow governmental entities.¹⁵³ We recommend that the Joint Conference continue this program. We further suggest that the government at all levels work to develop an inventory of resources, "best practices," and success stories to inspire and motivate others to undertake the difficult but ultimately rewarding task of bringing broadband to rural communities across this nation. Finally, we also recommend that the Joint Conference include in its recommendations suggested proposals to address and ameliorate the unique challenges presented to rural minority communities, rural low-income communities, and persons with disabilities residing in rural areas.

c. Coordination with Communities

67. Our goal of ubiquitous, affordable, and robust broadband for all will be achieved faster and more easily when everyone involved has access to the essential information and resources necessary to make informed decisions. Thus, in order to be successful in coordinating existing federal programs concerning rural broadband or rural initiatives, it is critical that the federal government collaborate and

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0805BROADBANDACCESS.PDF (NGA, STATE EFFORTS TO EXPAND BROADBAND) (explaining that California, Missouri, Hawaii, and Maryland have used state task forces to evaluate the current state of broadband deployment and identify possible regulatory changes to increase service availability in their states).

¹⁵⁰ For example, the Commonwealth of Virginia's Office of Telework and Broadband Assistance has produced a community guidebook or "toolkit" containing specific tools and resources that communities can leverage when they are assessing how to deploy broadband in their communities. See, e.g., Virginia.gov, Office of Telework Promotion and Broadband Assistance, Community Broadband Toolkit, http://www.otpba.vi.virginia.gov/roundtable_toolkit.shtml (last visited May 19, 2009) (Virginia.gov Toolkit); see also Karen Jackson, Director of the Telework Promotion and Broadband Access for the Commonwealth of Virginia, Address at the National Governors Association: State Efforts to Expand Broadband Access (Dec. 18, 2008), (transcript available at <http://www.apf.org/events/2008/1218broadband.txt> (last visited May 19, 2009)) (describing the efforts of the Commonwealth of Virginia's Center for Innovative Technology, and addressing related broadband issues such as "broadband-friendly zoning," along with expediting the permitting process and waiving or reducing fees, as well as mapping and engaging local communities).

¹⁵¹ The Joint Conference serves as a forum for an ongoing dialogue among the Commission, state regulators, and local and regional entities regarding the deployment of advanced telecommunications capabilities. It was convened in 1999 as an early step in the Commission's efforts to ensure that advanced services are deployed as rapidly as possible to all Americans, and reconstituted by the Commission on March 19, 2008. See *Commission Seeks Nominations for Federal-State Joint Conference on Advanced Services*, CC Docket No. 99-294, News Release (rel. Mar. 19, 2008); *Federal-State Joint Conference on Advanced Telecommunications Services*, CC Docket No. 99-294, Order, 14 FCC Rcd 17622 (1999). The Joint Conference is comprised of commissioners from state public utilities commissions and from the Commission, and is chaired by the Commission Chairman or his designee.

¹⁵² 2008 Farm Bill § 6112(a)(1)(C).

¹⁵³ Joint Conference Comments at 5.

coordinate with community and advocacy organizations in rural areas. The federal government should work closely with these organizations to help ensure that all minority group members residing in rural areas have access to robust and affordable broadband services and that minority-owned businesses participate fully in the buildout of broadband infrastructure in those areas. The federal government also should work closely with organizations representing persons with disabilities to help ensure that they have affordable access to broadband services capable of supporting the full array of applications responsive to their needs. Finally, the federal government should work closely with organizations that serve low-income residents to ensure the opportunities that affordable broadband offers this community do not go unrealized.

68. We know that community and local advocacy groups are an essential component to the success of deploying broadband in rural areas.¹⁵⁴ Further, public-private partnerships can play a critical role in bringing broadband to rural areas.¹⁵⁵ Community and advocacy groups and public-private partnerships can function as valuable information sources for local communities, businesses, and consumers in rural areas, and various groups have developed guidance on how to deploy broadband in those areas. For example, the Commonwealth of Virginia has produced an online “Community Broadband Tool-Kit” that provides step-by-step guidance on how a community can deploy broadband services.¹⁵⁶ This tool-kit has information on broadband applications and case-studies from Virginia localities that have successfully deployed broadband facilities. Another group, called Connecting Rural Communities, publishes a guidebook that explains in detail how to bring broadband services to rural communities.¹⁵⁷ The Michigan Department of Information Technology has released its own “Action Plan for Deploying Broadband Internet to Michigan Local Governments,” which similarly details how developing goals is essential for building a broadband network.¹⁵⁸

¹⁵⁴ Connected Nation Comments at 13.

¹⁵⁵ The key to many success stories was the formation of a core local group or team comprised of individuals from both the public and private sectors. For example, a local businessman who partnered with the community and local government succeeded in bringing to Stevenson, Washington, a municipality with a population of 1,300, a Wi-Fi network that blankets the entire downtown area. *See, e.g.,* City of Stevenson, Washington, Wi-Fi Project, <http://www.cityofstevenson.com/wifi.html> (last visited May 19, 2009). The Blacksburg Electronic Village, an online community center serving the needs of a diverse population, began with a collaboration among the Town of Blacksburg, Virginia Tech, Bell Atlantic (now Verizon), and other interested members of the community. *See* Blacksburg Electronic Village, <http://www.bev.net/> (last visited May 19, 2009). In addition, Connected Nation’s local leadership teams, comprised of community leaders from key sectors such as healthcare, education, security, and the local private and public sectors, were integral in creating a large public wireless broadband project in a very rural area, the Green River Area Development District of Kentucky. Connected Nation Comments at 13.

¹⁵⁶ *See* Virginia.gov Toolkit, http://www.otpba.vi.virginia.gov/roundtable_toolkit.shtml.

¹⁵⁷ The Connecting Rural Communities project was developed by the Penn State University and University of Minnesota Extension and was funded by the Southern Rural Development Center/Mississippi State University, in partnership with Cooperative State Research, Education, and Extension Service (CSREES)/USDA, as part of “The Rural e-Commerce Extension Initiative: A National Demonstration Project.” *See* Connecting Rural Communities, Welcome to Connecting Rural Communities, <http://www.connectingcommunities.info/index.cfm> (last visited Apr. 29, 2009). This guidebook simplifies the process to several discrete steps: (1) create a team, either an individual or small group, that realizes how connectivity can help future economic and social well-being; (2) learn about broadband; (3) assess what one has, such as what infrastructure and people skills one already has in the community; (4) design a network that can accommodate future growth; (5) create an action plan; (6) implement and evaluate; and (7) tell the story. *See* Connecting Rural Communities, Getting Started, <http://www.connectingcommunities.info/article.cfm?id=198> (last visited Apr. 29, 2009).

¹⁵⁸ *See* MICH. DEP’T OF INFO. TECH., ACTION PLAN FOR DEPLOYING BROADBAND INTERNET TO MICHIGAN LOCAL GOVERNMENTS, http://www.michigan.gov/documents/dit/Broadband_Reference_Guidebook_FINAL_212166_7.pdf (last visited May 19, 2009).

69. The federal government should collaborate with these organizations and ones like them to fully understand the challenges in deploying broadband in rural areas and develop solutions that overcome those challenges. We suggest that the federal government continue to take a leadership role alongside individuals, groups, businesses and other governmental organizations seeking to fit together all the pieces needed to bring state-of-the-art broadband services to rural areas.

B. Streamlining, Improving, and Coordinating Existing Federal Programs

70. Given the numerous federal programs currently addressing rural broadband, it is critical that those programs function efficiently and effectively to maximize consumer benefits. With so many programs addressing mostly complementary, but occasionally overlapping, aspects of rural broadband deployment there is the risk of duplication of effort and inefficient use of government resources. Given this, all relevant federal agencies should review their programs to identify what internal barriers, if any, may be making rural broadband deployment more difficult. Further, all federal agencies with responsibility for rural issues may wish to consider the need and opportunity for rural broadband deployment in designing their programs, as well as how their programs support the ability of minority-owned and small or disadvantaged businesses to employ broadband services. We note that all federal agencies have an opportunity to learn from the grantees and recipients of RUS and NTIA broadband funds and should identify the business models most successful in rural areas.¹⁵⁹

71. In addition to these overarching strategic elements to streamline and improve existing federal programs, we believe that there are additional specific considerations that should be taken into account. We discuss some of these considerations below.

1. Efficient Use of Government Funds and Resources

72. We recommend that federal agencies review their non-broadband programs regarding rural issues to see if those programs provide opportunities to promote rural broadband deployment. For example, given that one of the largest deployment costs of underground fiber networks is the expense associated with digging the trenches to lay the fiber, some commenters suggest that costs of those networks could be reduced if fiber could be installed at a time when roads are already being constructed or repaired. Thus, these commenters suggest that agencies responsible for road construction or repair should consider how these projects can be used to facilitate broadband deployment in rural areas.¹⁶⁰ In addition, relevant agencies could consider offering collocation space in federally-owned buildings to rural broadband providers that wish to interconnect with broadband facilities terminating in those buildings,¹⁶¹ developing expedited procedures for granting rights of way on public lands for broadband projects,¹⁶² or wiring government-supported housing for broadband.¹⁶³ We also suggest federal agencies consider how existing federal programs and resources can be maximized to spur rural broadband deployment.

¹⁵⁹ See, e.g., Lone Eagle Consulting Comments at 2 (suggesting the creation of an Office of Broadband Innovation Best Practices to focus on the identification and dissemination of best practices as they emerge); see also *supra* Part IV.A.2 (discussing coordination with state and local authorities).

¹⁶⁰ See, e.g., NMMLP Comments at 1; Mimi Pickering Comments at 1–2; Rural Broadband Policy Group Comments at 7; Pennsylvania Comments at 6; New America Foundation Comments, Attach. at 3; see also Broadband Conduit Deployment Act of 2009, H.R. 2428, 111th Cong. § 2 (2009) (requiring the installation of broadband conduit in highway construction projects).

¹⁶¹ See Benton Foundation Comments, Attach. A at 4.

¹⁶² See Access Humboldt Comments at 3; CTEF Comments at 1.

¹⁶³ See, e.g., ONE ECONOMY CORPORATION, ANNUAL REPORT 2007, at 4, available at <http://www.one-economy.com/sites/all/files/report2007-low-res.pdf> (last visited May 14, 2009) (stating that One Economy has

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2. Coordinating Program Criteria

73. Federal agencies involved in rural broadband initiatives should consider coordinating key terminology, such as the term “rural,” across their programs, consistent with their legislative mandates.¹⁶⁴ Dissimilar definitions and criteria across complementary programs can complicate the flow of funds to rural broadband users and hinder federal interagency coordination. Coordinating key terminology across related programs will help to ensure that federal programs work consistently and in concert with one another.

3. Government Websites

74. One of the challenges to rural broadband deployment and adoption is a lack of easy public access to comprehensive information about all the government resources available to help communities and individuals obtain access to broadband services. Although the federal agencies involved have attempted, under great time pressures, to publicize and educate the public about the programs implementing the Recovery Act, other broadband-related programs exist that would benefit from the same type of information dissemination. Further, the public would benefit enormously from the availability of one access point that serves as a central repository for information about all federal programs addressing rural broadband deployment. Consequently, to improve the efficiency and effectiveness of federal broadband initiatives and programs, and enable the public to take full advantage of available federal resources, we recommend the Commission, in coordination with other federal agencies, consider the development of a comprehensive website that will provide a centralized access portal for information concerning all federal programs addressing broadband.¹⁶⁵

75. In the meantime, as an aid in these efforts, we recommend that the Commission expand its website to include a comprehensive set of links to all federal government rural broadband-related programs.¹⁶⁶ The Commission and USDA have already taken some preliminary steps toward this end. In 2005, the Commission’s Wireless Telecommunications Bureau and RUS created the Joint Federal Rural Wireless Outreach Initiative to coordinate activities and essential information on programs and financial and other assistance regarding telecommunications opportunities for rural communities. This initiative seeks to encourage greater access and deployment of wireless services to enhance economic development throughout rural America. Since February 2008, the Commission and USDA have launched the “Broadband Opportunities for Rural America” website and held four regional educational workshops on rural broadband.¹⁶⁷ The website is designed to provide those in rural America looking to bring the benefits of broadband services to their communities with the expertise and resources of the Commission

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worked to change the affordable housing finance policies in 42 states to foster the inclusion of affordable broadband into the homes of low-income individuals).

¹⁶⁴ See John Cromartie & Shawn Bucholtz, *Defining the “Rural” in Rural America*, 28 AMBER WAVES 28, 29 (2008), available at <http://www.ers.usda.gov/AmberWaves/June08/Features/RuralAmerica.htm> (stating that there are more than two dozen rural definitions currently used by Federal agencies); see also, e.g., AT&T Comments at 2–3; NCTA Comments at 7–8; NRTC Comments at 8; Nebraska Commission Comments at 4; SBA Comments at 7; WISPA Comments at 5.

¹⁶⁵ See *National Broadband Plan NOI* at paras. 116–18.

¹⁶⁶ See 2008 Farm Bill § 6112(a)(2).

¹⁶⁷ The workshops provide communities and organizations in rural America seeking to bring the benefits of broadband to their communities with an opportunity to learn about the resources, programs, and policies of the Commission and USDA. *FCC and USDA to Conduct Regional Educational Workshops on Rural Broadband During 2008*, Public Notice, 23 FCC Rcd 1263 (2008).

and USDA in a single, easily-accessible location and user-friendly format.¹⁶⁸ We propose that the existing “Broadband Opportunities for Rural America” website be expanded to include a comprehensive list of all federal government programs related to rural broadband. This list could later be incorporated in, or linked to, a central website.

4. Delay Caused by Other Federal Requirements

76. The 2008 Farm Bill directs that this Report recommend ways to “address short- and long-term needs assessments and solutions for a rapid build-out of rural broadband solutions”¹⁶⁹ and “identify how specific Federal agency programs can best . . . overcome obstacles that currently impede rural broadband deployment.”¹⁷⁰ Meeting the goal of rapid deployment of broadband to rural areas will require federal agencies not only to resolve numerous issues, but also to implement their decisions quickly. We recommend that federal agencies having responsibility for addressing rural broadband matters consider reviewing their rules, regulations, or other requirements to identify those that might impede quick implementation of rural broadband. Agencies also might consider whether any of their routine processes or functions could be streamlined when rural broadband deployment is implicated.

V. ASSESSING RURAL BROADBAND NEEDS

77. While the Commission and USDA, as well as other federal, Tribal, state, and local government agencies have made efforts in recent years to address the lack of broadband in rural areas—through funding programs, regulatory actions, and outreach and data gathering initiatives—the need for rural broadband remains. The 2008 Farm Bill directs that this Report include recommendations “to address both short- and long-term needs assessments and solutions for a rapid buildout of rural broadband solutions and application of the recommendations for Federal, State, regional, and local government policymakers.”¹⁷¹ We set forth below our analysis of the most common problems that have been brought to our attention. We discuss activity to date with respect to each issue and offer recommendations.

A. Technological Considerations

78. The number and range of technological solutions available to speed the deployment of affordable broadband in rural areas is increasing. As in other parts of the country, a number of technologies are available to provide the various components of broadband access in rural areas.¹⁷² Each technology has specific cost and performance attributes that, coupled with compatibility and appropriateness of existing infrastructures and demand expectations, have an impact on its suitability for

¹⁶⁸ *FCC and USDA Launch Web Site Focused on Rural Broadband Opportunities*, News Release, FCC, Feb. 1, 2008. The site provides information on the different technology platforms that can be used to provide broadband service, how to access spectrum necessary for delivery of wireless broadband services, government funding for broadband services, relevant Commission and USDA proceedings and initiatives, including the programs and initiatives created as a result of the recent broadband legislation, and data on broadband deployment. In addition, the site provides instructions on how to locate companies already licensed to provide wireless services in or near specific rural communities, as well as helpful links to other government and private resources related to encouraging broadband opportunities in rural America. *Id.*

¹⁶⁹ 2008 Farm Bill § 6112(a)(1)(C).

¹⁷⁰ *Id.* § 6112(a)(1)(D).

¹⁷¹ *Id.* § 6112(a)(1)(C).

¹⁷² These include “wired” technologies, using fiber, coaxial cable, copper wires, or BPL; a variety of terrestrial wireless technologies; and also satellite technologies.

deployment in a particular rural area.¹⁷³ In particular, the introduction of new technologies and broadband deployment approaches increasingly enables providers using wireless, wireline, or satellite-based networks, or a combination thereof, to realize significant savings. This is particularly true with respect to providers building new networks in previously unserved rural areas.¹⁷⁴ Nevertheless, every technology has inherent capabilities and limitations. Those characteristics vary greatly among technologies. Similarly, every rural area presents its own special challenges, and a particular technological solution may be well-suited to one situation and poorly-suited to another. Therefore, decision makers should proceed on a technology-neutral basis—by considering the attributes of all potential technologies—in selecting the technology or technologies to be deployed in a particular rural area.

79. Rural broadband networks are fundamentally similar to broadband networks in other areas in that, in order to have broadband access to the Internet, they must include local access, or last-mile, broadband access to the end user and backhaul, or middle-mile, capabilities to an available Internet peering point. The last-mile network connects residential and business end users to a local ISP. In this configuration, the middle-mile or backhaul component connects the local ISP to an Internet peering point or node.¹⁷⁵ In rural settings, either or both of these components may not support robust broadband connectivity.¹⁷⁶ The choice of any local access or “middle-mile” technology in a rural setting must take into account factors including desired capacity, cost, reach, and the need for additional resources like radiofrequency spectrum, electronic equipment, access to poles and rights of way, and power.

80. The best choice for any particular area in all likelihood will reflect, in addition to the population density and terrain of the area, the capabilities and limitations of the technology or technologies under consideration. The technology choice should take into account the ability of each feasible solution to provide cost-effective broadband connectivity in a given area based on consistent, high-quality performance that ideally will be capable of evolving over time to meet the growing requirements of Internet access and may well combine a variety of wireline and wireless elements. Some of the technology issues to consider are discussed below.

81. *Latency.* Latency is the time delay from when an end user sends a signal to the moment that the signal reaches its intended destination and vice versa. It is relevant in all parts of the network. Network technologies that create significant time delay can arguably degrade the performance of many

¹⁷³ We also note that there are a wide variety of broadband applications requiring different functionalities. Some of the next-generation broadband applications require functionalities such as, for example, dramatically faster file transfer speeds for both uploads and downloads, and the ability to transmit streaming video. See INFORMATION TECHNOLOGY & INNOVATION FOUNDATION, THE NEED FOR SPEED: THE IMPORTANCE OF NEXT-GENERATION BROADBAND NETWORKS (March 5, 2009), available at <http://www.itif.org/files/2009-slides-needforspeed.pdf> (last visited Apr. 30, 2009).

¹⁷⁴ See generally Letter from Michele C. Farquhar, Counsel, LEMKO Corporation, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-29 (filed Apr. 16, 2009) (describing advanced wireless network architectures for rural deployments); see also Letter from Thomas Cohen, Counsel, Calix, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-29 (filed Apr. 7, 2009) (describing new approaches to fiber deployments, particularly in rural areas).

¹⁷⁵ Rural broadband networks are typically in locations that are geographically removed from Internet peering points or nodes. As a consequence, there may be no dedicated, high-capacity middle-mile line available to connect the local ISP with a peering point, and a rural ISP may therefore not be capable of providing robust broadband Internet access to its customers. See NECA Comments at 5–6 (finding that 55% of rural telephone companies are located more than 70 miles from a node and 10% are more than 200 miles away).

¹⁷⁶ See DigitalBridge Comments (“The lack of middle-mile infrastructure is one of the greatest obstacles to building sustainable rural broadband networks. Many middle-mile facilities were originally built by telephone and cable companies for ordinary telecommunications or cable television services. Rural communities are often still reliant upon these antiquated copper telephone and cable infrastructures, which lack the capabilities to deliver high-speed, broadband access.”).

interactive Internet applications.¹⁷⁷ The extent of the degradation increases with the extent of the delay. Latency is particularly important for voice applications such as VoIP¹⁷⁸ and Video Relay Service (VRS)¹⁷⁹ where a high degree of latency can degrade voice communication to an unintelligible level. Other non-voice, interactive Internet applications may also be less tolerant of the effects of latency. These include some educational applications,¹⁸⁰ some telework applications,¹⁸¹ telepresence,¹⁸² many telemedicine applications,¹⁸³ and interactive online gaming.¹⁸⁴ We note that these industries currently represent only a small portion of total Internet traffic.¹⁸⁵ However, all are burgeoning and have the potential to employ thousands of Americans and generate tremendous economic activity.¹⁸⁶ Latency therefore should be important in considering the best options for rural America.

¹⁷⁷ See Letter from Stephen L. Goodman, Counsel, ADTRAN, Inc., to Marlene H. Dortch, Secretary, FCC, WC Docket No. 09-40, app.1 at 3 (filed Apr. 13, 2009) (discussing allowable latency requirements for networks to retain an interactive experience for applications) (ADTRAN April 13, 2009 *Ex Parte* Letter); STUART CHESHIRE, VOLPE, WELTY, ASSET MGMT, LLC, LATENCY AND THE QUEST FOR INTERACTIVITY (Nov. 1996) (finding in 1996 that a signal can move through the Internet backbone from Stanford to Boston and back in less than 80 milliseconds (ms) and discussing theoretical speeds as a matter of physics), <http://www.stuartcheshire.org/papers/LatencyQuest.html>, cited in ADTRAN April 13, 2009 *Ex Parte* Letter, app. 1 at 6 n.5. See also Letter from C. Douglas Jarrett, Counsel, API, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 09-51 at 1 (filed May 12, 2009) (stating that the petroleum industry needs “more robust broadband infrastructure . . . in rural areas” and that “the industry’s operational/critical infrastructure industry requirements” “operate most efficiently with a maximum latency of 20 ms, and that latency approximating 100 ms adversely impacts these applications”).

¹⁷⁸ Interconnected VoIP providers made \$514 million in 2006, the first year that the Commission has data for that type of provider. See 2008 TRENDS IN TELEPHONE at tbl. 15.4.

¹⁷⁹ VRS is a form of telecommunications relay service that allows individuals with a hearing disability to communicate with voice telephone users using sign language that is transmitted through video equipment connected to a broadband Internet connection. The video link allows a relay agent to view and interpret the user’s signed conversation and relay the conversation back and forth with a voice telephone user. See 47 C.F.R. 64.601(a)(26); see generally 47 C.F.R. 64.601 *et seq.*

¹⁸⁰ Educational industries have emerged that are capable of supplying interactive educational experiences, such as for music lessons, over broadband connections. See, e.g., Internet2, Internet2 Member Community Education Initiatives, <http://www.internet2.edu/arts/member-education.html> (last visited May 20, 2009).

¹⁸¹ See, e.g., Cisco, WebEx, How it Works for Meetings, <http://www.webex.com/how-it-works/for-meetings.html> (last visited Apr. 23, 2009) (describing interactive video conferencing that allows users to share files virtually, show presentations, mutually browse, and record the meeting, among other features).

¹⁸² Youtube, Cisco Telepresence Magic, http://www.youtube.com/watch?v=rcfNC_x0VvE (last visited Apr. 23, 2009) (demonstrating telepresence and claiming \$1 billion in sales in 3 years for this “green” product).

¹⁸³ See, e.g., American Telemedicine Association, Home Telehealth & Remote Monitoring SIG, <http://www.americantelemed.org/i4a/pages/index.cfm?pageID=3320> (last visited Apr. 24, 2009) (discussing its home telemonitoring program and providing links that list various abstracts of peer reviewed articles involving interactive home telemedicine applications).

¹⁸⁴ Interactive online gaming is a billion dollar per year industry for one American-based video game developer alone. Seth Schiesel, *An Online Game, Made in America, Seizes the Globe*, N.Y. TIMES, Sept. 5, 2006, at A1 (noting that Blizzard Entertainment, Inc. made over \$1 billion the previous year mostly for ongoing subscriptions from the interactive massive multiplayer online game, World of Warcraft). See also Alex Pham, *The Work of Play: Video Games Grow Up*, L.A. TIMES, Oct. 19, 2008 (reporting that interactive online gaming is expected to make \$8 billion over the next ten years and that the video game industry employs thousands in California); Hiawatha Bray, *Computer vs. The Console: Downloads Give PC Games a Boost Battle for Buyers*, BOSTON GLOBE, Jun. 17, 2008.

¹⁸⁵ See CISCO SYSTEMS, INC., CISCO VISUAL NETWORKING INDEX—FORECAST AND METHODOLOGY, 2007–2012, at 4, tbl. 3 (2008), http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360.pdf (last visited May 15, 2009).

¹⁸⁶ See, e.g., *supra* notes 178–184 (discussing current and emerging revenue-generating network applications).

82. *Scalability.* Some technologies are easier to upgrade than others. An amply sized conduit can be filled with more cables to increase capacity; a conduit that is too small has to be supplemented with a new conduit to increase capacity. Fiber networks can easily be upgraded by swapping out the optoelectronic equipment. Copper broadband loops may be capable of economically feasible upgrades with new network and consumer premises equipment. Certain wireless networks can be upgraded with the latest technology through the relatively simple replacement of the network's software cards rather than the entire cell sites. In addition, an existing, multi-use radio tower may be able to support additional wireless infrastructure that helps provide new services, improve coverage, and increase the bit rate and efficiency of spectrum usage. Remote software upgrades are easier to accomplish than corresponding hardware upgrades, particularly in remote areas. Given the high fixed costs of constructing broadband networks, once built, they are not likely to be replaced, especially in rural areas that are unserved today. As a consequence, we believe that networks deployed in rural areas should not merely be adequate for current bandwidth demands. Instead, they also should be readily upgradeable to meet bandwidth demands of the future. An international comparison suggests significant additional capacity may be necessary. For example, while the average download speed for residential broadband subscribers in the United States is currently 2.3 Mbps, residential subscribers in Japan now average 63 Mbps.¹⁸⁷ Moreover, service providers in Hong Kong, Japan, South Korea, and Singapore either offer 1 Gbps residential service now or are planning to have comprehensive 1 Gbps residential service in the near future,¹⁸⁸ and South Korea is complementing its fiber rollout with 10 Mbps wireless 4G services for mobility.¹⁸⁹ Bandwidth-intensive applications could very quickly become the norm in the U.S.—even in rural areas. Technologies that cannot be upgraded easily could make Internet applications less than five years from now look like the dial-up downloads of today.

83. *Weather and Environmental Conditions.* Unfavorable weather and environmental conditions can affect transmission technologies. Rain, snow, extreme temperatures, salt, pollution, and wind can degrade some technologies' broadband performance or even render a technology unusable until the conditions change. However, these weather conditions are considered in the design phase of each system, and service outages are typically very limited in duration, on the order of a few minutes or less per month.¹⁹⁰ Technologies that are adversely affected by typical weather conditions are less useful than

¹⁸⁷ See ROBERT D. ATKINSON *et al.*, INFO. TECH. & INNOVATION FOUND., EXPLAINING INTERNATIONAL BROADBAND LEADERSHIP app. D at D1, D3 n.5 (May 2008), <http://www.itif.org/files/ExplainingBBLeadership.pdf> (last visited May 19, 2009) (providing the average data speeds for Japan based on advertised speeds of several major carriers in the country).

¹⁸⁸ See Amit Roy Choudhury, *Platform for Next Level of Growth: The Next Generation National Broadband Network Will Change the Way Singaporeans Work, Play and Live*, BUS. TIMES. (SINGAPORE), Mar. 30, 2009 (discussing Singapore's plans to have 100 Mbps to 95% of homes and businesses by 2012 with consideration to upgrade to 1 Gbps shortly thereafter); BBC Monitoring Service, *South Korea: Super-Speed Internet Planned by 2012*, BBC INT'L REP. (MEDIA), Feb. 2, 2009 (reporting that South Korea has committed to have 1 Gbps to the home with 10 Mbps wireless overlay by 2012); Richard Mumford, *RF and Microwaves in Asia: Economies of Scale*, 51 MICROWAVE J., INT'L ED. 118 (2008) (noting that Japan and Hong Kong already have 1 Gbps services to many homes and that South Korea is not far behind); see also Leslie Cauley, *FCC Pursues Goal of a Nationwide Affordable, Fast Internet*, USA TODAY, Apr. 8, 2009, at 5B (noting that Australia recently committed to 100 Mbps nationwide).

¹⁸⁹ *Korea to get 1Gbps Wired Internet by 2012*, ELECTRONISTA, Feb. 2, 2009, <http://www.electronista.com/articles/09/02/02/korea.to.get.1gbps.web/> (last visited May 15, 2009); see also Sung So-young, *IT Plan Calls for Big Spending, Jobs*, JOONGANG DAILY, Feb. 2, 2009, <http://joongangdaily.joins.com/article/view.asp?aid=2900490>.

¹⁹⁰ The International Telecommunication Union has published many recommendations concerning the availability and performance of various wireless services such as the fixed and mobile services, as well as satellite services. For example, ITU-R Recommendation F.1400 provides information on the performance and availability requirements (continued....)

alternatives that are not affected by weather.¹⁹¹

84. *Survivability, Redundancy, and Security.* As noted, investment in rural technologies will be for the long term. Ideally, decision makers should consider the survivability of the technology under adverse conditions. Extreme weather conditions can damage broadband infrastructure and could be especially devastating to the extent that a rural area might not have the resources to repair broadband facilities disrupted over a wide region. Disasters such as Hurricane Katrina have shown that infrastructure that is vulnerable to adverse weather events can leave large numbers of people without critical communications capability for long periods of time.¹⁹² Overall economics should be balanced with planning to ensure that critical facilities supporting large numbers of subscribers are adequately protected from foreseeable weather events. Middle mile and backhaul facilities specifically should be capable of surviving harsh environments and foreseeable disaster events. However, this may be difficult in rural environments. For example, there may be only a single right of way, making implementation of diverse strategies difficult. In such instances, hardening of critical facilities, e.g., trenching fiber to a depth of 3 feet or more, may be an alternative in building critical infrastructure. Moreover, all technologies present security concerns. America's future broadband network will be used for everything from our electrical grid to our emergency systems and will require infrastructure that is secure at every step.¹⁹³

85. *Distance and Topography.* How well a technology performs over extended distances and in the context of the local topography could be a critical factor in many rural areas. For instance, because some wireless technologies need uninterrupted lines of sight between nodes, terrain can block the proper transmission of signals: a technology that works well on an open plain may not be appropriate if mountains or dense forests occupy a significant portion of the transmission route. In addition, wireless signals using frequency bands below 1 GHz generally penetrate environmental obstructions better than signals using higher bands, making the lower-band technologies particularly well-suited for rural deployment.¹⁹⁴ Furthermore, wireless technologies that rely on additional infrastructure, such as a series

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and objectives for fixed wireless access to the public switched telephone network. ITU-R Recommendation S.1783 provides similar data for the satellites. There are numerous other Recommendations available for each service.

¹⁹¹ See Kodiak-Kenai Cable Comments at 3–4 (discussing satellite's frequent service disruptions as justification for building the "all weather" Northern Fiber Link); JOHN S. SEYBOLD, INTRODUCTION TO RF PROPAGATION 257 (2005) (discussing satellite rain fade and rain attenuation); SAMI TABBANE, HANDBOOK OF MOBILE RADIO NETWORKS 32 (2000) (discussing how wireless technologies are affected by rain).

¹⁹² See SELECT BIPARTISAN COMMITTEE TO INVESTIGATE THE PREPARATION FOR AND RESPONSE TO HURRICANE KATRINA, US HOUSE OF REPRESENTATIVES, A FAILURE OF INITIATIVE: THE FINAL REPORT OF THE SELECT BIPARTISAN COMMITTEE TO INVESTIGATE THE PREPARATION FOR AND RESPONSE TO HURRICANE KATRINA (Feb. 15, 2006), http://katrina.house.gov/full_katrina_report.htm (noting that Katrina's destruction of pole mounted backhaul facilities was a major contributing factor to the long-term disruption of communications in the wake of that hurricane).

¹⁹³ See, e.g., Ellen Nakashima & R. Jeffrey Smith, *Electric Utilities May Be Vulnerable to Cyberattack*, WASH. POST, Apr. 9, 2009, at A4.

¹⁹⁴ JOHN S. SEYBOLD, INTRODUCTION TO RF PROPAGATION 2, 6 (2005). See Valerie Fast Horse Comments at 3 (urging the Commission to allow the use of new low-frequency spectrum that can penetrate trees and make non-line-of-site communication possible). For example, as compared to providing service at higher frequencies, the unique propagation characteristics of the 700 MHz band mean that fewer towers will be needed to serve a given license area, thereby lowering infrastructure costs. See *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems; Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones; Biennial Regulatory Review—Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services; Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part* (continued....)

of repeaters or amplifiers, to regenerate a signal over long distances may not be appropriate in some settings. Wireline technologies typically require poles or trenches for deployment, which may be more costly in areas of permafrost and rocky terrain.

86. *Maintenance and Repair.* Some technologies are more expensive to maintain and repair than others. All structures eventually deteriorate over time, but some materials and technologies are naturally more durable than others. Because sustainability is a serious consideration for many rural areas, the lower the maintenance and repair costs, the more likely the technology will prove to be cost-effective over time. For example, optical technology, because of its lack of outside plant electronics, relative immunity to moisture, and sophisticated diagnostic capabilities, offers significant maintenance advantages.

87. *Resource Contention and “Micro-Congestion.”* Some technologies operate on a shared last-mile platform and some offer dedicated last-mile capacity. Shared technologies often provide greater peak performance than dedicated technologies. However, when the access network is congested, the performance an individual user experiences on a shared-technology network can be significantly worse than that over a dedicated last-mile network. When comparing the speed of broadband access networks, it is important to consider peak performance, typical performance, and minimum performance. Resource contention may also exist in the backhaul or middle-mile portions of the network. Moreover, some technologies are more susceptible to “micro-congestion” or “jitter,” which occurs “whenever a large number of packets come from a faster network link to a slower network link or where several networks links merge to a single link.”¹⁹⁵ High jitter can make use of interactive applications difficult.¹⁹⁶

B. Assessment of Broadband Deployment

1. Broadband Data Collection

88. As recognized above,¹⁹⁷ we do not have comprehensive and reliable data on the extent of broadband availability and subscribership in rural areas. Nor do we have sufficient information on rural broadband demand, transfer speeds, and prices, or on the infrastructure available to help provide broadband services to unserved and underserved rural areas. This lack of information constitutes a significant challenge to ubiquitous and robust broadband deployment in rural areas.¹⁹⁸ Policymakers, entrepreneurs, community groups, and consumers all need accurate information in these information categories in order to make informed decisions. We recommend that the Commission work to collect this

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27 of the Commission’s Rules; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010, WT Docket Nos. 06-150, 96-86, 03-264, 01-309, 06-169, CC Docket No. 94-102, PS Docket No. 06-229, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8064 (2007) (*700 MHz Report and Order*); Second Report and Order, 22 FCC Rcd 15289, 15348, para. 154 (2007), *recon. pending* (*700 MHz Second Report and Order*).

¹⁹⁵ See GEORGE OU, THE INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION, *MANAGING BROADBAND NETWORKS: A POLICYMAKER’S GUIDE* 10 (2008).

¹⁹⁶ See *id.*

¹⁹⁷ See *supra* Part III.B (discussing the current dearth of data regarding the state of broadband in America).

¹⁹⁸ ACS Comments at 4; Connected Nation Comments at 4 (“[I]dentifying and mapping unserved and underserved areas—is a necessary factual guide for any rural broadband strategy.”); NASUCA Comments at 5 (“Another key to a national rural broadband strategy is knowing where broadband service is available, and at what speeds and at what prices.”); NATOA Comments at 6.

information, in coordination with the administration and Tribal and state governments. We provide a brief overview of each of these information categories below.

89. *Availability and Subscribership.* Determining the extent to which broadband service is available in rural areas, and the extent to which consumers and businesses subscribe in areas where it is offered, are key elements of assessing broadband needs and deployment. Data collected for smaller geographic areas and for discrete population subgroups, such as Tribal Nations, minority groups, and persons with disabilities, are generally more informative than data collected for larger areas or groups. In addition, provider-specific and technology-specific data on broadband availability and subscribership would help policymakers evaluate issues such as the level of broadband competition in rural areas and the extent to which certain technology platforms are better suited to serve certain types of rural markets. It may also be important to identify the availability and subscribership of broadband at typical “anchor institutions,” such as schools, libraries and health institutions, which play a unique role in both introducing the benefits of broadband to a community as well as stimulating further subscriber growth. Furthermore, overlaying or correlating granular availability and subscribership data with data for other metrics, such as population density, income, and terrain, will allow policymakers to understand the steps needed to increase broadband availability and subscribership in particular rural areas.

90. *Speeds.* Information on the data transfer speeds available to and experienced by rural broadband users is an important component in assessing rural broadband deployment. The Commission has recognized that the broadband connection speeds that customers experience are neither constant nor identical to the advertised speeds or the theoretical maximums of a given network or particular service configuration.¹⁹⁹ Ideally, data collected on broadband speeds would acknowledge such differences and attempt to accurately reflect the average or typical data transfer rates that broadband users experience.

91. *Prices.* Because the price of broadband service affects the consumer’s decision whether or not to subscribe, detailed pricing information could be helpful in analyzing the lack of broadband subscribership in rural areas. We recognize that collecting and analyzing pricing information raises various complexities, such as how to determine the price of broadband service offered as part of a service bundle, how to account for introductory offers and promotions, and how to keep pace with frequent price fluctuations.²⁰⁰ Nevertheless, we believe information on broadband prices, including how prices vary among rural communities and service tiers, could be helpful because of the key role that prices play in broadband demand and adoption.

92. *Demand.* Policymakers also should consider obtaining detailed information on the demand for broadband services. As discussed in detail below,²⁰¹ promoting broadband deployment will require steps to increase broadband demand as well as supply. Addressing broadband demand effectively likely will require specific survey data on the interest or lack of interest in broadband service among non-subscribers, and the reasons for that interest or lack of interest. Such data ideally would be available for various demographics such as age, location, and income; for businesses; and for certain classes of institutional users, such as schools, libraries, public safety agencies, and hospitals.²⁰² A special focus also

¹⁹⁹ See *Development of Nationwide Broadband Data to Evaluate Reasonable and Timely Deployment of Advanced Services to All Americans, Improvement of Wireless Broadband Subscribership Data, and Development of Data on Interconnected Voice over Internet Protocol*, WC Docket No. 07-38, Report and Order and Further Notice of Proposed Rulemaking, 23 FCC Rcd 9691, 9709–11, para. 36 (2008) (*2008 Broadband Data Gathering Order*).

²⁰⁰ See *id.* at 9710, para. 37.

²⁰¹ See *infra* Part V.C.

²⁰² See Microsoft Comments at 2 (arguing that schools need capacity sufficient to deliver high-quality video to the classroom, but noting that currently, there is no reliable data on the number or type of schools that have such capacity).

must be given to Tribal members and minorities, where the lack of broadband subscribership appears particularly acute.

93. *Infrastructure.* The metrics described above focus on evaluating the different components of the rural broadband marketplace. In addition to examining data for these metrics, a needs assessment also could examine information on the existing infrastructure in rural areas that is or could be used to provide broadband service. For example, policymakers could consider gathering data on the Internet backbone and middle-mile Internet access points,²⁰³ including fiber routes and fiber-lit locations; locations of base stations, towers, switches, and collocation facilities; and locations of non-communications infrastructure, such as water towers, railroads, and highways, that could support broadband network facilities.

94. *Federal Efforts to Assess Broadband Availability.* The Commission has been tracking broadband subscribership and deployment since 2000 through its Form 477 local competition and broadband deployment reporting program. Providers of high-speed Internet access service—formerly defined as data speeds exceeding 200 kbps in at least one direction—are required to submit to the Commission semi-annually data regarding several metrics, including their number of broadband subscribers, data rates, and technology platforms. In its Section 706 Reports, the Commission has used these data to assess whether “advanced telecommunications capability” is being deployed to all Americans in a reasonable and timely manner.²⁰⁴

95. Although past Section 706 Reports included an incomplete analysis of the broadband market and relied on data that lacked sufficient granularity,²⁰⁵ the changes to the Commission’s broadband data collection rules adopted in the *2008 Data Gathering Order* and the new requirements for Section 706 Reports included in the BDIA should improve those reports going forward. In the *2008 Data Gathering Order*, the Commission required most broadband providers to file subscribership information, including their number of subscribers—broken down by technology, speed tier, and business/residential—on a Census Tract level.²⁰⁶ That order increased the number of speed tiers (both upload and download) for broadband reporting purposes in order to provide a more granular depiction of the data rates at which broadband consumers access the Internet.²⁰⁷ Providers of mobile wireless broadband services must submit their broadband subscriber totals on a state-by-state basis as well as a list of the Census Tracts covered by their mobile broadband networks.²⁰⁸ In addition to reporting their number of broadband-capable mobile devices in use, mobile broadband providers now must specify the

²⁰³ As discussed above, this backbone is part of the foundation needed to make broadband services available in all areas. See *supra* Part V.A (regarding technological considerations).

²⁰⁴ See *supra* note 103 (regarding the Commission’s section 706 Reports).

²⁰⁵ See, e.g., *Section 706 Fifth Report*, 23 FCC Rcd at 9685 (Commissioner Copps, dissenting).

²⁰⁶ See *2008 Broadband Data Gathering Order*, 23 FCC Rcd at 9695–99, paras. 10–15.

²⁰⁷ The Commission updated the broadband reporting tiers to include upload and download speeds of: (1) greater than 200 kbps but less than 768 kbps; (2) equal to or greater than 768 kbps but less than 1.5 Mbps; (3) equal to or greater than 1.5 Mbps but less than 3.0 Mbps; (4) equal to or greater than 3.0 Mbps but less than 6.0 Mbps; (5) equal to or greater than 6.0 Mbps but less than 10.0 Mbps; (6) equal to or greater than 10.0 Mbps but less than 25.0 Mbps; (7) equal to or greater than 25.0 Mbps but less than 100.0 Mbps; and (8) equal to or greater than 100 Mbps—for a total of 72 tiers. *2008 Broadband Data Gathering Order*, 23 FCC Rcd at 9700–01, para. 20. The previous five “speed tiers” were based on the transfer rate of the connection’s faster direction and were divided as follows: (1) greater than 200 kbps but less than 2.5 Mbps; (2) greater than or equal to 2.5 Mbps but less than 10 Mbps; (3) greater than or equal to 10 Mbps but less than 25 Mbps; (4) greater than or equal to 25 Mbps but less than 100 Mbps; and (5) greater than or equal to 100 Mbps. *Local Telephone Competition and Broadband Reporting*, WC Docket No. 04-141, Report and Order, 19 FCC Rcd 22340, 22347–48, para. 14 (2004).

²⁰⁸ See *2008 Broadband Data Gathering Order*, 23 FCC Rcd at 9698–99, para. 16.

percentage of those users that have devices and subscription packages that permit them to access the lawful Internet content of their choice.²⁰⁹ Broadband providers subject to these reporting requirements must file Form 477 twice each year. The Commission staff is in the process of analyzing the first round of Form 477 filings under these new rules, which were due March 16, 2009. The next Form 477 data filings are due on September 1, 2009.

96. In addition to collecting the Form 477 broadband data, the Commission tracks the deployment of mobile wireless broadband networks in its *Annual CMRS Competition Reports*.²¹⁰ With this information, the Commission is able to estimate, at the Census Block level, the percentage of the U.S. population covered by various mobile broadband network technologies.²¹¹ The Commission annually collects data on cable system broadband capability, including subscriber numbers and capacity, using FCC Form 325.²¹² The Commission also collects data on the satellite industry for its *Annual Satellite Competition Reports*, which examine the reach of satellite-based, two-way broadband to the home.²¹³

97. In October 2008, Congress passed the BDIA, which provides for improved federal data on the deployment and adoption of broadband services.²¹⁴ That Act requires the Commission to issue its Section 706 Reports “annually” instead of “regularly” and adds several types of data regarding broadband services that the Commission must produce and evaluate. Specifically, the BDIA requires that the Commission’s Section 706 Report discretely identify “unserved” areas, as well as the population, population density, and average per capita income of each of these areas.²¹⁵ Further, the Commission must conduct a consumer survey at least annually that includes questions regarding broadband technology choices, prices, speeds, applications, consumer decisions and options.²¹⁶ The BDIA also requires the Commission to conduct and evaluate an international comparison of broadband speeds and prices.²¹⁷ On March 31, 2009, the Commission released a Public Notice seeking comment on how it should implement the BDIA’s consumer survey and international comparison requirements.²¹⁸

98. *Broadband-Related Efforts in the States.* Many efforts have been made at the state level to review and improve broadband deployment. For example, in California, Governor Schwarzenegger commissioned a Broadband Task Force to “remove barriers to broadband access, identify opportunities for increased broadband adoption, and enable the creation and deployment of new advanced

²⁰⁹ See *id.* at 9703–04, para. 23.

²¹⁰ These maps are provided through a contract with American Roamer. See *supra* note 47.

²¹¹ *Id.*

²¹² See 1998 Biennial Regulatory Review—Annual Report of Cable Television Systems, Form 325, filed Pursuant to Section 76.403 of the Commission’s Rules, CS Docket No. 98-61, Report and Order, 14 FCC Rcd 4720 (1999).

²¹³ E.g., Annual Report and Analysis of Competitive Market Conditions with Respect to Domestic and International Satellite Communications Services, IB Docket No. 07-252, Second Report, 23 FCC Rcd 151570 (2008).

²¹⁴ See *supra* Part III.D (regarding recent legislative developments).

²¹⁵ BDIA § 103(a).

²¹⁶ *Id.* § 103(c).

²¹⁷ Specifically, section 103(b) of the BDIA states: “As part of the assessment and report required by section 706 of the Telecommunications Act of 1996 (47 U.S.C. 157 note), the Federal Communications Commission shall include information comparing the extent of broadband service capability (including data transmission speeds and price for broadband service capability) in a total of 75 communities in at least 25 countries abroad for each of the data rate benchmarks for broadband service utilized by the Commission to reflect different speed tiers.” *Id.* § 103(b)(1).

²¹⁸ See Comment Sought on International Comparison and Consumer Survey Requirements in The Broadband Data Improvement Act, GN Docket No. 09-47, Public Notice, 24 FCC Rcd 3908 (2009).

communications technologies.”²¹⁹ This Task Force’s final report, issued in January 2008, includes broadband availability and speed maps as well as recommendations for improving broadband deployment throughout California.²²⁰ Similarly, in the Commonwealth of Virginia, Governor Kaine established a Broadband Roundtable to advance the goal of broadband access for all Virginia businesses by 2010.²²¹ The Roundtable has met with local and regional leaders and collected information concerning broadband deployment, community needs, and barriers to deployment throughout Virginia. As discussed above, in response to those meetings, the Roundtable created an online resource to guide participants in community-led broadband initiatives,²²² and in September 2008 issued a final report on broadband issues facing Virginia.²²³

99. Other efforts at the state level have focused on using public-private partnerships to expand access to broadband, while also assessing the demand for broadband services.²²⁴ These efforts include ConnectKentucky’s efforts to bring broadband services to previously unserved areas within Kentucky.²²⁵ Other states, including Minnesota, Ohio, South Carolina, Tennessee, and West Virginia, have adopted public-private partnerships following the ConnectKentucky model.²²⁶

100. Some states have provided tax incentives to encourage investment in broadband infrastructure and other related equipment and expenses;²²⁷ created dedicated funding that leverages private sector funds to increase investment in broadband infrastructure;²²⁸ and engaged local communities to identify and increase demand for broadband deployment in unserved areas.²²⁹ Finally, there have been a number of regional efforts to increase rural broadband deployment. For example, in Southeastern

²¹⁹ CALIFORNIA BROADBAND REPORT at 7.

²²⁰ *Id.*

²²¹ XO/Nextlink Comments at 2.

²²² *See supra* at 65; *see also* Virginia.gov Toolkit.

²²³ COMMONWEALTH’S BROADBAND ROUNDTABLE, FINAL REPORT (Sept. 9, 2008) *available at* http://www.otpba.vi.virginia.gov/pdf/Governor_report.pdf (last visited May 18, 2009) (VIRGINIA BROADBAND ROUNDTABLE FINAL REPORT); *see also* XO/Nextlink Comments at app. A.

²²⁴ *See, e.g.,* Connected Nation Comments at 1–3.

²²⁵ Connected Nation at Comments at 1. ConnectKentucky, a pilot program that led to Connected Nation, worked with the private sector to create an online map of broadband availability in Kentucky and to conduct consumer surveys to identify barriers to broadband adoption in that state. Connected Nation Comments at 1, 12–13.

²²⁶ Connected Nation Comments at 8; *see* Harris Corporation Comments at 4 (supporting public-private partnerships because private companies can contribute “managerial efficiencies and technological proficiency,” while government can “provide the economic incentive for private companies to deploy broadband in rural areas, especially where such an incentive has never previously existed”).

²²⁷ *See infra* Part V.C (regarding stimulating demand).

²²⁸ *See, e.g.,* NGA, STATE EFFORTS TO EXPAND BROADBAND (stating that the California Public Utilities Commission allocated \$100 million to provide matching funds of up to 40% of the total project cost of broadband infrastructure deployment projects in California); *id.* (stating that the Vermont Telecommunications Authority has the authority to issue up to \$40 million in state-backed bonds to finance the construction of broadband infrastructure in Vermont).

²²⁹ *See* Pennsylvania Comments at 2. *See generally* BROADBAND INVESTMENT FOR ECONOMIC RECOVERY: PERSPECTIVES OF AN AD-HOC GROUP OF STATE BROADBAND ENTITIES 5–6 (Feb. 9, 2009), *attached to* Massachusetts Comments (describing a variety of approaches that states have used to encourage broadband deployment, including creating specific agencies to focus on broadband; fostering public-private cooperation and co-investment; funding access with grants or loans; streamlining rights of way; mapping broadband facilities; promoting education efforts; encouraging inclusion of telecommunications infrastructure in the planning and deployment of capital improvement projects; and setting goals for broadband deployment and use).

Wisconsin, an advisory committee was established to implement a regional broadband plan covering seven counties, of which about 64 percent of the land area is rural.²³⁰ The Appalachian Regional Commission and the Delta Regional Authority also have made efforts to encourage broadband deployment in their respective regions.²³¹

2. Broadband Mapping

101. Mapping provides a powerful and expressive way to convey information, and may be uniquely suited to explaining the status and progress of the evolution of broadband deployment and to targeting deployment obstacles. In the rural context, broadband mapping is a necessary tool for identifying and tracking broadband service availability and infrastructure deployment. However, as with any visualization or other presentation of information, the utility of a map is only as good as the underlying data, and the accuracy and reliability of such data must be verifiable. Similarly, broadband mapping efforts must reconcile the sometimes competing concerns of technical limitations, confidentiality, and infrastructure security.

102. The Recovery Act directs NTIA to create a “comprehensive nationwide inventory map of existing broadband service capability and availability” that shows the geographic extent to which that capability is deployed and available for each state.²³² By February 2011, NTIA should to the extent practical make this inventory map accessible by the public on an NTIA website in a form that is interactive and searchable.²³³

103. A number of different organizations have begun to map broadband availability in several states.²³⁴ The entities vary, although most of them are public-private partnerships,²³⁵ or task forces established by a governor and similarly comprised of community, government, and broadband industry representatives.²³⁶ In addition, a handful of state public utility commissions also map broadband availability,²³⁷ as do certain state-sponsored initiatives.²³⁸ Apart from mapping, these organizations generally seek to promote broadband deployment throughout their states, particularly in rural areas. These organizations typically rely on voluntary submissions of data on residential broadband availability, and the entities collocating the data often sign non-disclosure agreements and make other commitments (such as agreeing to depict only aggregated data) in response to providers’ requests for confidentiality.²³⁹

²³⁰ HierComm Comments at 2–3.

²³¹ Connected Nation Comments at 8.

²³² Recovery Act § 6001(l).

²³³ *Id.*

²³⁴ See, e.g., Connected Nation Comments at 8 (identifying Alabama, Arkansas, California, Colorado, Hawaii, Illinois, Kansas, Kentucky, Maine, Massachusetts, Minnesota, North Carolina, Ohio, Tennessee, Virginia, and West Virginia); see Broadband Access in Illinois, Institute for Regulatory Policy Studies, Illinois State University, August 2007, available at <http://www.irps.ilstu.edu/broadband/IRPS%20Broadband%20Report%20080907.pdf> (last visited March 20, 2009); e-NC, Broadband Access in North Carolina, <http://e-ncbroadband.org/> (last visited April 1, 2009).

²³⁵ See, e.g., Connected Nation Comments at 1, 7 (explaining that Connected Nation is a non-profit organization with operations in nine states that grew out of the ConnectKentucky pilot initiative).

²³⁶ See, e.g., CALIFORNIA BROADBAND REPORT; VIRGINIA BROADBAND ROUNDTABLE FINAL REPORT.

²³⁷ See, e.g., VT DEP’T OF PUB. SERV., APPROXIMATE BROADBAND AVAILABILITY IN VERMONT—2006 (2007), http://publicservice.vermont.gov/cable/broadband_availability_map.html.pdf (providing a map of broadband availability).

²³⁸ See, e.g., e-NC Authority, Who We Are, <http://www.e-nc.org/WhoWeAre.asp> (last visited April 1, 2009).

²³⁹ See, e.g., Comments of Connected Nation, WC Docket No. 07-38 at 35.

Many of these mapping efforts have resulted in useful maps of network broadband availability, although we are aware of no state mandate that all broadband providers must submit broadband availability data. We note also that certain commenters in the Commission's availability mapping proceeding question the independence and effectiveness of many of the non-governmental broadband mapping organizations.²⁴⁰

104. Several federal agencies have mapping programs for various initiatives. Federal mapping efforts can and should play a pivotal role in overcoming the challenges that currently impede rural broadband deployment. Elsewhere in this Report, we discuss in detail the importance of coordination among governmental organizations and private parties.²⁴¹ Such coordination will be critical to making the best use of the data being gathered through the efforts discussed above.²⁴² We recognize the importance of including all rural areas, particularly Tribal lands, in federal mapping efforts. Pursuant to the Recovery Act and the BDIA, the Commission and the Administration should continue their efforts to coordinate federal, Tribal, state, local, and private mapping efforts.

C. Stimulating and Sustaining Demand for Broadband

105. A critical component in addressing solutions to promote rural broadband deployment is ensuring the sustainability of rural broadband networks. That is, once built, the networks must generate enough revenue to cover their costs. Several surveys show that a substantial percentage of consumers in the United States have access to broadband services, but choose not to subscribe.²⁴³ Given that sustained deployment of broadband services is unlikely without sufficient consumer demand for broadband services, a strategy designed to promote rural broadband adoption must examine and address the discrepancy between broadband availability and broadband adoption. Rural areas have diverse populations and varied terrains.²⁴⁴ They also have variable access to resources, and are served, if at all, by various types of providers (*e.g.*, a large incumbent LEC, a small local cooperative, or a WISP), each of which may have differing levels of technical expertise, business experience, and access to capital markets. We discuss below the various factors that may affect demand for, and sustainability of, broadband services in rural areas.

²⁴⁰ See, *e.g.*, American Public Power Ass'n. Comments, WC Docket No. 07-38, at 5; Consumers Union Comments, WC Docket No. 07-38, at 6–7 n.4, 17; Kentucky Municipal Utilities Reply, WC Docket No. 07-38, at 6, 13. *But see* Connected Nation Comments, WC Docket No. 07-38, at 6, 10, 12–13 (stating that the vast majority of Connected Nation's funding is from public sources and it is unbiased and that its ability to keep data confidential increases voluntary disclosures by providers); Connected Nation Reply, WC Docket No. 07-38, at ii–iii, 12–18.

²⁴¹ See *supra* Part IV.A (discussing interagency coordination).

²⁴² See *supra* Part V.B.1 (discussing broadband data collection).

²⁴³ See Connected Nation Comments at 9 (stating that according to a Connected Nation study, approximately 90% of households in the U.S. have access to some form of broadband service, but only 50% of households choose to subscribe); NCTA Comments at 15, Attach. 1 at 2 (estimating that there are approximately 35 million households in the U.S. that have access to broadband but do not currently use it).

²⁴⁴ See, *e.g.*, Rural Broadband Policy Group at 5 (noting the diversity of rural America in "terrains, cultures, foods, peoples, and knowledge" and opining that there is no "one size fits all solution"); Access Humboldt Comments at 1 (agreeing with the Rural Broadband Policy Group).

106. Several factors may contribute to low consumer demand for broadband services.²⁴⁵ First, a lack of training and knowledge regarding the benefits of Internet access may hinder broadband adoption.²⁴⁶ Many individuals in non-broadband households view broadband as either unimportant or difficult to use.²⁴⁷ For example, TIA claims that approximately 42 percent of rural residents without broadband at home fail to subscribe because of a “perceived lack of need.”²⁴⁸ The Pew American Home Life Project survey found similar perceptions among those that did not have Internet access, finding that an estimated 40 percent of non-users do not use the Internet because “they are not interested” or view it as “a waste of time.”²⁴⁹

107. Another demand and sustainability factor is the affordability of broadband services to consumers, which may include continuing subscription costs, computer equipment costs,²⁵⁰ and the costs of other customer premises equipment necessary to access broadband services.²⁵¹ Some studies show that many dial-up users believe they cannot afford broadband services.²⁵² According to CFA/CU, only 15 percent of rural households with annual incomes less than \$25,000 have broadband subscriptions whereas 45 percent of rural households with annual incomes greater than \$25,000 have broadband access in the home.²⁵³ These studies demonstrate that the inability of consumers to afford either broadband service or the computer equipment necessary to access broadband service at current market prices is a likely barrier to broadband adoption and sustainability in certain rural markets.

²⁴⁵ For example, one estimate of the demand for Internet access services indicates that approximately 29% of the U.S. population in 2007 did not use the Internet. Internet use is defined as a household with a subscription to either broadband or dial-up or use of a terminal outside the home to access the Internet. See U.S. CENSUS BUREAU, TABLE 1118. HOUSEHOLD INTERNET USAGE IN AND OUTSIDE OF THE HOME, BY SELECTED CHARACTERISTICS: 2007, <http://www.census.gov/compendia/statab/tables/09s1118.pdf> (last visited May 19, 2009) (TABLE 1118). TIA, citing to the Pew Internet and American Life Project, claims that approximately one quarter of the population does not use the Internet. TIA Comments at 4.

²⁴⁶ See, e.g., NCTA Comments at 15; TIA Comments at 4.

²⁴⁷ See, e.g., NCTA Comments, Attach. at 10 (citing John B. Horrigan, *Obama's Online Opportunities II: If You Build It, Will They Log On?*, at iii, 12 (2009))

²⁴⁸ See CONNECTED NATION, CONSUMER INSIGHTS TO AMERICA'S BROADBAND CHALLENGE 11 (Oct. 13, 2008), available at http://www.connectednation.com/_documents/ConsumerInsightsBroadbandChallenge_20081013.pdf (CONNECTED NATION REPORT), cited by TIA Comments at 4. According to NCTA, nearly half of the population that does not subscribe to broadband says it does not need such a connection. NCTA Comments, Attach. at 10 (citing CONNECTED NATION REPORT at 2).

²⁴⁹ See 2008 PEW BROADBAND ADOPTION STUDY at 12–13.

²⁵⁰ According to TIA, 34% of rural consumers do not have Internet access due to the lack of a computer. TIA Comments at 4.

²⁵¹ In the *National Broadband Plan NOI*, the Commission sought comment on the extent to which it should encourage or subsidize broadband subscription in areas where service is already available. *National Broadband Plan NOI* at paras. 27, 39–41, 54.

²⁵² See NCTA Comments, Attach. A at 11 (citing 2008 PEW BROADBAND ADOPTION STUDY at ii, 11, to show that 35 percent of consumers surveyed responded that the price of broadband would have to fall for them to subscribe).

²⁵³ See CFA/CU Comments at 2. Another estimate shows that for households with an income in the \$20,000 to \$24,999 range, 28.9% had broadband subscriptions, whereas 77% of the households with incomes in the \$75,000 to \$99,999 range subscribed to broadband services. See NTIA, HOUSEHOLDS USING THE INTERNET. The Benton Foundation also provides an estimate of decreasing broadband adoption by income. For Americans with incomes under \$20,000 annually, broadband penetration has fallen from 29% in 2007 to 25% in 2008. Benton Foundation Comments at 6.

108. Demand-side programs can effectively promote the adoption and use of broadband among underserved and rural populations.²⁵⁴ Congress already has taken important steps in this regard. For example, the BTOP program, established by the Recovery Act, provides funding for, among other measures, grants to provide broadband education, awareness, training, access, equipment, and support to educational institutions, libraries, healthcare providers, and other community support organizations to facilitate greater use of broadband. The Recovery Act also directs grants to support organizations and agencies that provide outreach, access, equipment, and support services to facilitate greater use of broadband service by low-income, unemployed, aged, and otherwise vulnerable populations.²⁵⁵ The Recovery Act provides, in addition, at least \$250 million in funding for innovative programs to encourage sustainable adoption of broadband service.²⁵⁶ In singling out these purposes, Congress recognized the importance of consumer affordability and education in ensuring the adoption and sustainability of rural broadband networks.

109. In its *National Broadband Plan* proceeding, the Commission is exploring long-term solutions to address the lack of demand for broadband services.²⁵⁷ Specifically, the *National Broadband Plan NOI* sought comment on improving digital literacy and media literacy skills, increasing broadband access device ownership, and the effect of content and copyright protections on broadband network deployment and usage.²⁵⁸ The *National Broadband Plan NOI* also sought comment on the extent to which a centralized clearinghouse for outreach and computer and broadband training initiatives should be a component of the national broadband plan.²⁵⁹

110. Some training and education programs are already underway to increase adoption of broadband in local communities.²⁶⁰ Rural libraries, which currently serve as an access point for broadband Internet service, can provide another avenue for Internet training and education, as librarians are well-positioned to educate and train individuals on the benefits of Internet access.²⁶¹ Further, libraries can stimulate demand for broadband services by hosting community fora and providing training on accessing specific information.²⁶² Rural libraries can also function as public computing centers, providing broadband Internet access to patrons, which in turn can help stimulate further demand for consumer broadband services.²⁶³ We suggest that Internet education focus on general digital literacy as well as the

²⁵⁴ See, e.g., Benton Foundation Comments at 8, Attach. at 7, 10; Rural Broadband Policy Group Comments at 1; Connected Nation Comments at 3, 9; NASUCA Comments at 5–6; NCTA Comments at 15, Attach. at 1–2, 4.

²⁵⁵ Recovery Act § 6001(b).

²⁵⁶ Recovery Act, Division A, Title II, National Telecommunications and Information Administration (Broadband Technology Opportunities Program Appropriations).

²⁵⁷ *National Broadband Plan NOI* at paras. 55–57.

²⁵⁸ *Id.*

²⁵⁹ *Id.*

²⁶⁰ For example, Connected Nation operates community-based organizations that sponsor computer training and education to increase the value of accessing the Internet for businesses. Connected Nation Comments at 10. Connected Nation also sponsors grassroots “eCommunity Leadership Teams” comprised of community leaders from key sectors that develop and implement technology promotion plans within their communities. Connected Nation Comments at 11–12. However, we note that these programs are not necessarily specifically directed to rural areas.

²⁶¹ See ALA Comments at 3.

²⁶² See ALA Comments at 3, 6.

²⁶³ Public computing facilities can provide numerous benefits to users in the community. See generally U.S. Dep’t of Hous. and Urban Dev., Multifamily Housing – Neighborhood Networks, <http://www.hud.gov/offices/hsg/mfh/nnw/nnwaboutnn.cfm> (last visited May 19, 2009) (describing HUD’s Neighborhood Networks initiative, which encourages property owners and managers to open onsite, multiservice technology centers, which has resulted in

(continued....)